

## Fluoroquinolone-Associated Bilateral Patellar Tendon Rupture: A Case Report and Review of the Literature

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**ABSTRACT** Single series case reports have described bilateral traumatic patellar tendon ruptures, and less frequently, with little or no trauma. Patellar tendon rupture most often occurs in patients younger than 40 years old and is commonly precipitated by a sudden, significant eccentric contraction. Patellar tendon ruptures are uncommon in those older than 40 years of age, but when they occur, may indicate an underlying systemic disorder. Corticosteroid injections, rheumatic disease, metabolic disorders, and fluoroquinolone use have all been associated with increased risk of tendon rupture. While the Achilles tendon is the most commonly affected by fluoroquinolone use, cases involving the rotator cuff, biceps, wrist extensors, and quadriceps tendon among others, have been described. A case is presented of a 43-year-old man without pre-existing medical comorbidities who sustained atraumatic bilateral patellar tendon ruptures following a treatment course of fluoroquinolone medication.

### INTRODUCTION

Single series case reports have described bilateral traumatic patellar tendon ruptures, and less frequently, with little or no trauma.<sup>1-4</sup> Corticosteroid injections, race, anabolic steroid use, rheumatic disease, metabolic disorders, and fluoroquinolone use have all been associated with increased risk of tendon rupture.<sup>4-8</sup> The first documented report describing tendonopathy associated with fluoroquinolone use was in 1983,<sup>9</sup> and the first case of fluoroquinolone-associated Achilles tendon rupture followed 8 years later in 1991.<sup>10,11</sup> Since then, there has been much published, describing the association between fluoroquinolone use and tendon disorders, including tendonitis and tendon rupture. While the Achilles tendon is the most commonly affected by fluoroquinolone use, cases involving the rotator cuff, biceps, wrist extensors, quadriceps tendon, and patellar tendon among others, have been described.<sup>12-15</sup> To our knowledge, this case report describes the first bilateral patellar tendon rupture following a treatment course of fluoroquinolone medication.

### CASE REPORT

A 43-year-old Latino male without pre-existing medical comorbidities presented to our emergency department with bilateral knee pain and inability to ambulate. He reported carrying a television when his "knees gave out" simultaneously. This mechanism of injury placed a bilateral eccentric load on his knee extensor mechanisms. His medical history was significant only for completing a 10-day course of ciprofloxacin to treat an upper respiratory infection 3 months before injury.

On physical exam, the patient sat with knees slightly flexed and had a visible and palpable defect of the patellar tendon bilaterally (Figs. 1 and 2). He was unable to extend either knee or hold an extended knee against gravity. Radiographs were obtained showing patella alta bilaterally (Fig. 3). He was diagnosed with bilateral patellar tendon ruptures and elected to undergo surgical repair. Intraoperatively, he was found to have disruption of the patellar tendon just distal to the inferior pole of the patella bilaterally. The patient underwent direct primary repair of both patellar tendon ruptures using a transosseous suture technique.

Postoperatively, the patient remained full weight bearing in extension for 4 weeks followed by progressive range of motion. At 12-months follow-up, he has regained full knee range of motion and has normal knee extension motor strength.

### DISCUSSION

Patella tendon rupture most often occurs in patients younger than 40 years old and is commonly precipitated by a sudden, significant eccentric contraction. Zernicke determined that the force necessary to rupture the patellar tendon in healthy patients is approximately 17.5 times body weight.<sup>1</sup> Patients often present with pain, swelling, and inability to extend the knee. On physical exam, there will be a palpable defect of the patellar tendon and the patient will be unable to extend the knee actively or maintain a passively extended knee against gravity. In the rare case of bilateral patellar tendon rupture, there is not a normal limb to use for comparison during physical exam, which may delay diagnosis. Radiographs can be obtained during work-up, which will demonstrate superior displacement of the patella on the lateral view (patella alta), as seen in this case (Fig. 3).

Surgical repair of the patellar tendon is required after a complete tendon rupture to restore optimal function. Ideally, it is performed soon after the injury to minimize tendon retraction and adhesion, which can make reapproximation difficult. Typically, a Bunnell or Krackow-type suture repair is done with a heavy, nonabsorbable suture, with a direct end to end

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**FIGURE 1.** Photograph of the patient's bilateral knees upon presentation to our emergency department. The patella, tibial tubercle and palpable tendon are drawn in on the right knee.



**FIGURE 2.** The patella and palpable end of the patellar tendon are drawn in on the left knee.



**FIGURE 3.** Lateral radiographs of bilateral knees taken upon presentation.

repair or the suture can be passed from the tendon end through patellar or tibial tubercle drill holes dependent on rupture location. The repair is carefully tensioned to re-establish tendon length and a cerclage suture or wire can be added to reinforce

the repair. Due to tendon retraction, alternative reconstructive techniques are often necessary for delayed repairs to include autogenous or allograft augmentation.<sup>16</sup>

Patellar tendon ruptures are uncommon in those older than 40 years of age, but when they occur, they may indicate an underlying systemic disorder. In 2001, Rose et al. reviewed all bilateral patellar tendon ruptures, identifying 48 cases in the English literature. Sixteen (33%) occurred in the absence of trauma. Twelve (75%) of these patients had systemic disease, including prior steroid injections, rheumatologic disease, renal failure, and metabolic disorders. In cases of traumatic or sports-related bilateral patellar tendon rupture, only 16 (50%) had systemic disease.<sup>4</sup> While our patient was 43 years old, he has no known systemic disorder or risk factor for tendon rupture other than recent fluoroquinolone use. In their review, Rose et al. did not identify any cases of fluoroquinolone-associated bilateral patellar tendon ruptures.

Many reports linking fluoroquinolone use and tendon disorders have been published since the first case was reported in 1983.<sup>10-15,17</sup> Khaliq et al. reviewed 98 cases of fluoroquinolone-associated tendonopathy, finding that the Achilles tendon was the most commonly affected (90%). Thirty-nine (44%) cases were bilateral, and tendon rupture occurred in 40 (41%). The average time of treatment before tendon injury was 8 days, but ranged from 2 hours after first dose to 6 months after completion of treatment. Although dependent on prescribing practices, 25% of cases were associated with ciprofloxacin.<sup>7</sup> Our patient completed a course of ciprofloxacin 3 months before tendon rupture, which is well within the range reported by Khaliq et al.

Van der Linden reviewed 42 cases of tendon disorders attributed to fluoroquinolone usage in The Netherlands. In this review, the tendon disorder was tendonitis in 32 (76%) cases and tendon rupture in 10 (24%). Only one case involved patellar tendonopathy (quadriceps femoris).<sup>17</sup> More recently, Karistinos and Paulos reported a case of bilateral quadriceps tendon rupture, one side 30 days following completion of a course of ciprofloxacin, the other 20 days later.<sup>14</sup> Similar to Khaliq's findings, 13 (31%) of the cases in Van der Linden's review were associated with ciprofloxacin.<sup>17</sup>

Kannus et al. reviewed biopsy specimens from 891 cases of spontaneous tendon rupture from 1968 to 1989, including 53 patellar tendon ruptures. They compared these cases with 445 control specimens taken from cadavers at time of death from previously healthy individuals. The authors reported pathologic changes in all ruptured tendons, but similar changes were found in only 155 (35%) of controls. A total of 97% of all ruptured tendons had degenerative changes, including hypoxic degeneration tendonopathy, mucoid degeneration, tendolipomatosis, and calcifying tendonopathy. The remaining 3% had pathologic changes such as intratendinous foreign body or tumor.<sup>18</sup> Movin et al. performed a histological exam of an Achilles tendon with tendonopathy associated with fluoroquinolone use and found irregular collagen fiber arrangement, hypercellularity, and increased glycosaminoglycans, similar to findings seen in overuse injuries.<sup>19</sup>



Williams et al. examined the effects of ciprofloxacin on fibroblast metabolism in vitro using canine Achilles tendon, paratenon, and shoulder capsule. When compared to controls, there was a statistically significant decrease of 66–68% in cell proliferation at day 3 in culture. While lower concentrations did not reach statistical significance, ciprofloxacin concentrations of 50 µg/mL resulted in decreases of 36–48% in collagen synthesis. In addition, ciprofloxacin caused a 14–16% reduction in proteoglycan synthesis in all fibroblast cell lines.<sup>20</sup> We believe that these findings likely occurred in our patient, resulting in bilateral patellar tendon rupture.

In conclusion, bilateral patellar tendon ruptures are rare and in atraumatic cases, an underlying systemic disorder is likely the cause. Basic science research supports the association of fluoroquinolone use and tendon disorders seen clinically. While the incidence of fluoroquinolone-associated tendonopathy remains low, estimated to be between 10 and 15 per 100,000 prescriptions, these antibiotics are widely prescribed and many physicians, including those in the military, will likely encounter this complication.<sup>12</sup> Physicians should consider fluoroquinolone-associated tendonopathy during work-up of a tendon disorder if the patient has taken a fluoroquinolone up to 6 months before presentation. Prescribers must be aware of these potential side effects and avoid fluoroquinolones in patients with increased risk of tendonopathy if alternatives are available.

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